SECTION 02714

GEOTEXTILES

PART 1 GENERAL

1.01 SCOPE

A. This Section includes geotextile products furnished by Fluor Daniel Fernald (FDF) and installed by the Contractor.

1.02 RELATED SECTIONS AND PLANS

A. Section 02215 - Trenching and Backfilling

B. Part 8 - Environmental Health and Safety, and Training Requirements

C. Part 9 - Quality Assurance Requirements

1.03 REFERENCES

A. Latest version of American Society for Testing and Materials (ASTM) Standards:

1. ASTM D 3786. Standard Test Method for Hydraulic Bursting Strength of Knitted Goods and Nonwoven Fabric-Diaphragm Bursting Strength Test Method.
2. ASTM D 4355. Standard Test Method for Deterioration of Geotextiles from Exposure to Ultraviolet Light and Water.
3. ASTM D 4491. Standard Test Method for Water Permeability of Geotextiles by Permittivity.
4. ASTM D 4533. Standard Test Method for Trapezoid Tearing Strength of Geotextiles.
5. ASTM D 4632. Standard Test Method for Breaking Load and Elongation of Geotextiles (Grab Method).
6. ASTM D 4751. Standard Test Method for Determining Apparent Opening Size of a Geotextile.
7. ASTM D 4833. Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products.

8. ASTM D 4873. Standard Guide for Identification, Storage, and Handling of Geotextiles.
9. ASTM D 5261. Standard Test Method for Measuring Mass Per Unit Area of Geotextiles.

B. Federal Standard No. 751a - Stitches, Seams, and Stitching.

1.04 HEALTH AND SAFETY REQUIREMENTS

A. Environmental, health and safety, and other training requirements shall be as specified in Part 8 of the Contract Documents.

PART 2 PRODUCTS

2.01 GEOTEXTILE

A. Fluor Daniel Fernald (FDF) will furnish geotextile products that meet the following requirements:
1. minimum average roll values (95 percent lower confidence limit) meeting or exceeding the required property values specified in Tables 02714-1 (for geotextile filters, sacrificial geotextile filters, and sacrificial geotextile cushions), 02714-2 to 02714-4 (for geotextile cushions and supplemental geotextile cushions), and 02714-5 (for geotextile separators); and
2. manufactured from first quality polymers, with not more than 20 percent reclaimed polymer used in production.

B. Contractor shall furnish polymeric threads for stitching that are ultra-violet (UV) light stabilized to at least the same requirements as the geotextile to be sewn. Threads shall be polyester or polypropylene threads that have a minimum size of 2,000 denier.

2.02 PACKAGING

A. Geotextiles rolls will be wrapped in relatively impermeable and opaque protective covers.

B. Covers which become torn or damaged shall be repaired by the Contractor with similar materials.

C. Geotextile rolls will be marked or tagged in accordance with ASTM D 4873 with the following information:
   1. manufacturer's name;
   2. product identification;
   3. lot or batch number;
   4. roll number; and
   5. roll dimensions.

D. Geotextile rolls not labeled in accordance with this Section or on which labels are illegible shall be rejected and replaced. The Contractor shall notify the Construction Manager of any rolls not labeled in accordance with the Section.

2.03 ACCEPTANCE, HANDLING AND STORAGE

A. Within 45 days of Authorization to Mobilize, Contractor shall inspect and inventory the geotextile material and the manner in which it is being stored. Contractor shall provide letter of acceptance within 45 days to the Construction Manager if material is acceptable for installation. Contractor shall also notify the Construction Manager in writing within 45 days of any geotextile material that is not acceptable for installation.

B. Maintain a program for protection and preservation of geotextile to include, but not be limited to:
   1. protection from sunlight, moisture, excessive heat or cold, puncture, mud, dirt, and dust or other damaging or deleterious conditions; follow all geotextile manufacturer recommendations for handling and storage; Manufacturer recommendations will be provided by the Construction Manager; and
   2. storage of rolls on palates or other elevated structures; do not store rolls directly on the ground.

PART 3 EXECUTION

3.01 PLACEMENT

A. Do not commence geotextile installation until the CQC Consultant completes performance evaluation of previous work, including evaluation of Contractor's survey results for previous work.

B. Handle geotextiles so as to ensure they are not damaged in any way.

C. Take precautions to prevent damage to underlying layers including rutting during placement of the geotextiles.

D. After unwrapping the geotextiles from its opaque cover, do not leave them exposed for a period in excess of 10 calendar days.

E. If white colored geotextiles are used, take precautions against "snowblindness" of personnel.

F. Take care not to entrap stones, excessive dust, or moisture in the geotextiles during placement.

G. Anchor or weight geotextile with sandbags, or the equivalent, to prevent damage from wind. Install such sandbags during placement and maintain them until overlying material is placed. Immediately remove any damaged or leaking sandbags.

H. Examine the geotextile surface after installation to ensure that no potentially harmful foreign objects are present. Remove any such objects and replace any damaged geotextiles.

3.02 SEAMS AND OVERLAPS

A. Continuously overlap a minimum of 6 inches and sew filter, cushion, and supplemental cushion geotextiles (i.e., spot sewing is not allowed) using a "single prayer" seam. Sew seams using Stitch Type 401 as per Federal Standard No. 751a.

B. Do not install horizontal seams on slopes that are steeper than 10 horizontal to 1 vertical. Seams shall be along, not across, the slopes.

C. Overlap separator geotextiles a minimum of 12 inches and spot sew at intervals to ensure that the overlap is maintained.

3.03 REPAIR

A. Repair any holes or tears in the geotextiles using a patch made from the same geotextile material. Extend geotextile patches a minimum of 1 foot beyond the damaged area. Sew geotextile patches into place no closer than 1 inch from any panel edge. Should any tear exceed 50 percent of the width of the roll, cut across entire width and seam as an end seam.

B. Remove any soil or other material that may have penetrated the torn geotextiles.

3.04 CREST ANCHORAGE SYSTEM

A. Install the geotextile along with the other geosynthetic layers in the anchor trench at the crest of the slope as shown on the Construction Drawings. Temporarily anchor the geosynthetic layers using sandbags or other means until the commencement of trench backfilling. Do not place geotextiles in anchor trench if standing water is present.

B. Do not entrap soil, sand bags, or other materials between the geosynthetic layers.

C. Backfill the anchor trench with compacted clay once all the geosynthetic layers are installed in the anchor trench. Backfill to the limits shown on the Construction Drawings. Compact backfill in accordance with Section 02215.

D. Do not damage any geosynthetic layer when backfilling the anchor trench.

E. Do not place granular drainage material for the leak detection system or leachate collection system on the side slopes until after the anchor trenches are completely backfilled unless authorized by Construction Manager.

3.05 PLACEMENT OF SOIL AND AGGREGATE MATERIALS

A. Place soil materials on top of geotextiles in such a manner as to ensure that:
   1. the geotextiles and the underlying materials are not damaged; and
   2. slippage does not occur between the geotextile and the underlying layers during placement.

B. Spread soil on top of the geotextile to cause the soil to cascade onto the geotextile rather than be shoved across the geotextile.

C. For geotextile cushions overlying the geomembrane, do not place granular drainage material at ambient temperatures below 40 degrees Fahrenheit (F) or above 104 F, unless authorized in writing by the Construction Manager. For cold (<40 F) and hot (>104 F) weather placement operations, use the methods authorized in writing by the Construction Manager.

D. Do not drive equipment directly on the geotextile. Only use equipment above a geotextile cushion overlying a geomembrane that meets the following ground pressure requirements:

Maximum Allowable Equipment Ground Pressure (pounds per square inch)	Minimum Thickness of Overlying Fill (inches)
<5	12
<10	18
<20	24
>20	36

E. Place aggregate over geotextile separators as shown on the Construction Drawings prior to trafficking. Tailgate spreading of road stone over the geotextile may be used for gravel roads and Access Corridor under conditions approved in writing by the Construction Manager. Note that the cell access ramp is not included for this alternate placement method.

F. Place soil over geotextile filters as shown on the Construction Drawings prior to trafficking.

3.06 CONSTRUCTION QUALITY REQUIREMENTS

A. The CQC Consultant will monitor geotextile installation as required by the Construction Quality Assurance (CQA) Plan, referenced in Part 9 of the Contract Documents.

TABLE 02714-1

REQUIRED PROPERTY VALUES FOR GEOTEXTILE FILTER

PROPERTIES	QUALIFIER	UNITS[5]	SPECIFIED[4] VALUES	TEST METHOD
Type				
Nonwoven needlepunched				(-)
Polymer composition	minimum	%	95 polypropylene or polyester by weight	(-)
Mass per unit area	minimum	oz/yd^2	7	ASTM D 5261
Filter Requirements				
Apparent opening size (O_{95})	maximum	mm	0.21	ASTM D 4751
Permittivity	minimum	sec^{-1}	0.5	ASTM D 4491
Mechanical Requirements				
Grab strength	minimum	lb	180	ASTM D 4632[1]
Tear strength	minimum	lb	75	ASTM D 4533[2]
Puncture strength	minimum	lb	75	ASTM D 4833[3]
Burst strength	minimum	psi	350	ASTM D 3786
Durability				
Ultraviolet Resistance	minimum	%	70	ASTM D 4355

Notes:

(1) Minimum of values measured in machine and cross machine directions with 1 inch clamp on Constant Rate of Extension (CRE) machine.
(2) Minimum value measured in machine and cross machine direction.
(3) Tension testing machine with a 1.75-inch diameter ring clamp, the steel ball being replaced with 0.31-inch diameter solid steel cylinder with flat tip centered within the ring clamp.
(4) All values represent minimum average roll values.
(5) mm = millimeter
% = percent
oz/yd^3 = ounce per square yard
sec = second
lb = pound
psi = pound per square inch

TABLE 02714-2

REQUIRED PROPERTY VALUES FOR GEOTEXTILE CUSHION IN FINAL COVER SYSTEM

PROPERTIES	QUALIFIER	UNITS	SPECIFIED[4] VALUES	TEST METHOD
Type				
Nonwoven needlepunched				(-)
Polymer composition	minimum	%	95 polypropylene or polyester by weight	(-)
Mass per unit area	minimum	oz/yd^2	8	ASTM D 5261
Mechanical Requirements				
Grab strength	minimum	lb	200	ASTM D 4632[1]
Tear strength	minimum	lb	75	ASTM D 4533[2]
Puncture strength	minimum	lb	90	ASTM D 4833[3]
Burst strength	minimum	psi	350	ASTM D 3786
Durability				
Ultraviolet Resistance @ 500 hours	minimum	%	70	ASTM D 4355

Notes:

(1) Minimum of values measured in machine and cross machine directions with 1 inch clamp on Constant Rate of Extension (CRE) machine.
(2) Minimum value measured in machine and cross machine direction.
(3) Tension testing machine with a 1.75-inch diameter ring clamp, the steel ball being replaced with 0.31-inch diameter solid steel cylinder with flat tip centered within the ring clamp.
(4) All values represent minimum average roll values.
(5) mm = millimeter
% = percent
oz/yd^2 = ounce per square yard
sec = second
lb = pound
psi = pound per square inch

TABLE 02714-3

REQUIRED PROPERTY VALUES FOR GEOTEXTILE CUSHION IN LINER SYSTEM

PROPERTIES	QUALIFIER	UNITS[5]	SPECIFIED[4] VALUES	TEST METHOD
Type				
Nonwoven needlepunched				(-)
Polymer composition	minimum	%	95 polypropylene or polyester by weight	(-)
Mass per unit area	minimum	oz/yd^2	10	ASTM D 5261
Mechanical Requirements				
Grab strength	minimum	lb	225	ASTM D 4632[1]
Tear strength	minimum	lb	90	ASTM D 4533[2]
Puncture strength	minimum	lb	120	ASTM D 4833[3]
Burst strength	minimum	psi	450	ASTM D 3786
Durability				
Ultraviolet Resistance	minimum	%	70	ASTM D 4355

Notes:

(1) Minimum of values measured in machine and cross machine directions with 1 inch clamp on Constant Rate of Extension (CRE) machine.
(2) Minimum value measured in machine and cross machine direction.
(3) Tension testing machine with a 1.75-inch diameter ring clamp, the steel ball being replaced with 0.31-inch diameter solid steel cylinder with flat tip centered within the ring clamp.
(4) All values represent minimum average roll values.
(5) mm = millimeter
% = percent
oz/yd^3 = ounce per square yard
sec = second
lb = pound
psi = pound per square inch

TABLE 02714-4

REQUIRED PROPERTY VALUES FOR SUPPLEMENTAL GEOTEXTILE CUSHION IN LINER SYSTEM

PROPERTIES	QUALIFIER	UNITS[5]	SPECIFIED[4] VALUES	TEST METHOD
Type				
Nonwoven needlepunched				(-)
Polymer composition	minimum	%	95 polypropylene or polyester by weight	(-)
Mass per unit area	minimum	oz/yd^2	16	ASTM D 5261
Mechanical Requirements				
Grab strength	minimum	lb	350	ASTM D 4632[1]
Tear strength	minimum	lb	120	ASTM D 4533[2]
Puncture strength	minimum	lb	180	ASTM D 4833[3]
Burst strength	minimum	psi	700	ASTM D 3786
Durability				
Ultraviolet Resistance	minimum	%	70	ASTM D 4355

Notes:

(1) Minimum of values measured in machine and cross machine directions with 1 inch clamp on Constant Rate of Extension (CRE) machine.
(2) Minimum value measured in machine and cross machine direction.
(3) Tension testing machine with a 1.75-inch diameter ring clamp, the steel ball being replaced with 0.31-inch diameter solid steel cylinder with flat tip centered within the ring clamp.
(4) All values represent minimum average roll values.
(5) mm = millimeter
% = percent
oz/yd^3 = ounce per square yard
sec = second
lb = pound
psi = pound per square inch

TABLE 02714-5

REQUIRED PROPERTY VALUES FOR GEOTEXTILE SEPARATOR

PROPERTIES	QUALIFIER	UNITS[5]	SPECIFIED[4] VALUES	TEST METHOD
Type				
Nonwoven				(-)
Polymer composition	minimum	%	95 polypropylene or polyester by weight	(-)
Mass per unit area	minimum	oz/yd^2	6	ASTM D 5261
Mechanical Requirements				
Grab strength	minimum	lb	180	ASTM D 4632[1]
Tear strength	minimum	lb	75	ASTM D 4533[2]
Puncture strength	minimum	lb	75	ASTM D 4833[3]
Burst strength	minimum	psi	350	ASTM D 3786
Durability				
Ultraviolet Resistance	minimum	%	70	ASTM D 4355

Notes:

(1) Minimum of values measured in machine and cross machine directions with 1 inch clamp on Constant Rate of Extension (CRE) machine.
(2) Minimum value measured in machine and cross machine direction.
(3) Tension testing machine with a 1.75-inch diameter ring clamp, the steel ball being replaced with 0.31-inch diameter solid steel cylinder with flat tip centered within the ring clamp.
(4) All values represent minimum average roll values.
(5) mm = millimeter
% = percent
oz/yd^3 = ounce per square yards
c = second
lb = pound
psi = pound per square inch

[END OF SECTION]